REMARKS/ARGUMENTS

Favorable consideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1, 2, 5-11 and 14-19 are presently pending in this application, Claims 6-10 and 15-18 having been withdrawn from further consideration by the Examiner, Claims 3, 4, 12 and 13 having been canceled, Claims 1, 2, 5, 11 and 14 having been amended, and Claim 19 having been newly added by the present amendment. Support for the amendments and the addition in the claims can be found in the original application, for example, the specification, page 5, lines 16-19; page 6, lines 20-28; page 7, line 13, to page 8, line 1; page 8, line 15, to page 9, line 1; page 10, line 23, to page 11, line 8; page 12, line 7 to page 13, line 2; page 14, line 24 to page 16, line 5. Thus, no new matter has been believed to be added.

In the outstanding Office Action, Claim 2 was rejected under 35 U.S.C. §112, as failing to comply with the written description requirement; Claims 5 and 11-14 were rejected under 35 U.S.C. §112, second paragraph, for being indefinite; Claims 1 and 11 were rejected under 35 U.S.C. §102(b) as being anticipated by Ohira et al. (U.S. Patent 6,309,618); and Claims 1-5 and 11-14 were rejected under 35 U.S.C. §103(a) as being unpatentable over JP 2002-224565 (hereinafter "JP '565") in view of WO 02/058824 (hereinafter "WO '824").

With regard to the rejections under 35 U.S.C. §112, first and second paragraphs, Claims 2, 5, 11 and 14 have been amended to clarify the subject matter recited therein. Thus, Claims 2, 5, 11 and 14 are believed to be in compliance with the requirements of the statute. If, however, the Examiner disagrees, the Examiner is invited to telephone the undersigned who will be happy to work in a joint effort to derive mutually satisfactory claim language.

Before addressing the outstanding art rejections, a brief summary of Claim 1 is believed to be helpful. Claim 1 as currently amended is directed to a method of treating a gas containing a fluorine-containing compound. In the method, a gas including one or more

fluorine-containing compounds is contacted with a treatment agent at a temperature of 550 to 850°C. The fluorine-containing compounds include fluorinated hydrocarbons and/or perfluoro compounds. The treatment agent includes an agglomerate including calcium hydroxide particles attached to surfaces of aluminum hydroxide particles. The calcium hydroxide particles have a particle diameter of 3-10 μm, and the aluminum hydroxide particles have a particle diameter of 50-100 μm. By contacting the gas with such a treatment agent in the form of an agglomerate, the fluorine-containing compound can first react with aluminum hydroxide fine particles to produce a compound such as HF, and this compound can immediately react with the calcium hydroxide particles present on the surface of the aluminum hydroxide particles. Thus, the treatment of the gas can proceed very efficiently at a lower temperature (see, for example, specification, page 9, line 26 to page 10, line 12).

Ohira et al. describes a method for treating gas, but fails to teach or suggest "contacting a gas including at least one fluorine-containing compound with a treatment agent" where "the at least one fluorine-containing compound comprises at least one of a fluorinated hydrocarbon and a perfluoro compound," and "the treatment agent comprises an agglomerate including calcium hydroxide particles attached to surfaces of aluminum hydroxide particles, the calcium hydroxide particles have a particle diameter of 3-10 μm, and the aluminum hydroxide particles have a particle diameter of 50-100 μm" as recited in Claim 1. On the other hand, Ohira et al. relates to a method for treating halogen fluoride discharged from a dry cleaning step in a semiconductor manufacturing process, and the decomposition of halogen fluoride involves substantially different processes from those involved in the method of Claim 1 for treatment of fluorinated hydrocarbons and perfluoro compounds.

The differences between the treatment methods are at least partly due to the differences in the properties of the gas under treatment. For example, halogen fluoride is

sufficiently reactive and can decompose in the presence of a certain treating agent around an ordinary temperature (see col. 8, lines 32-37 of Ohira et al.). In contrast, fluorinated hydrocarbons and perfluoro compounds are more thermally stable, and thus conventional methods of decomposing fluorinated hydrocarbons and perfluoro compounds in the presence of a treatment agent (such as aluminum oxide) required heating at 800-1000°C. Also, the difference in the reactivity of the treated gas affects the selection of the type and/or form of the treatment agent as well. Specifically, Ohira et al. states that the treating agent could have a particle size of approximately from 0.5 to 10 mm, more preferably on the order of from 1 to 5 mm (see col. 8, lines 7-11). In contrast, the method of Claim 1 involves a treatment agent including "an agglomerate including calcium hydroxide particles attached to surfaces of aluminum hydroxide particles" where "the calcium hydroxide particles have a particle diameter of 3-10 μm, and the aluminum hydroxide particles have a particle diameter of 50-100 μm." Nowhere does Ohira et al. teach or suggest a treatment agent having such an agglomerate form. Therefore, the subject matter of Claim 1 is clearly distinguishable from Ohira et al.

JP '565 and WO '824 relate to a method for treating fluorocarbons and a process for decomposition of fluorine containing compounds, respectively. However, neither of the references teaches "contacting a gas including at least one fluorine-containing compound with a treatment agent" where "the at least one fluorine-containing compound comprises at least one of a fluorinated hydrocarbon and a perfluoro compound," and "the treatment agent comprises an agglomerate including calcium hydroxide particles attached to surfaces of aluminum hydroxide particles, the calcium hydroxide particles have a particle diameter of 3-10 μm, and the aluminum hydroxide particles have a particle diameter of 50-100 μm" as recited in Claim 1.

JP '565 and WO '824 merely describe chemical processes and treating agents substantially different from those in the method of Claim 1. JP '565 describes a method of treating fluorocarbons such as CF_4, which requires the use of a combination of aluminum oxide and oxides of alkali earth metals as a treating agent. Regarding the treating agent, JP '565 simply states that it may have a diameter of 0.1-20 mm (paragraph 0019) and is silent about an agglomerate form. WO '824 is directed to a treatment process which first subjects a fluorine containing compound to hydrolysis in the presence of catalysts in stage (i) to produce hydrogen fluoride, and then removes hydrogen fluoride by an absorbent in stage (ii). As such, WO '824 is simply concerned with pore sizes of the material employed as catalyst or absorbent and does not describe a catalyst in the form of agglomerate.

In contrast, the method of Claim 1 employs a treatment agent including an agglomerate of aluminum hydroxide particles and calcium hydroxide particles, and thus the treatment of the fluorine-containing compound can be performed very efficiently. To illustrate the superiority of such a treatment agent, Applicants have compared the efficiency of the treatment agents in Example 1 of the present application and Example 1 of JP '565 as in Table (I) below.

Table (I)

		Example 1 of JP '565	Example 1 of this application
Treatment agent		alumina	aluminum hydroxide
Treatment conditions	Inflow CF_4 concentration (%)	1.0	1.0
	Flow rate of gas under treatment (ml/min)	1,000	410
	Volume of treatment agent (ml)	415	49
	Space velocity (SV) of gas (hr^{-1})	145	502
	Temperature (°C)	860	650
Results		Removal rate of 99.9% achieved in 51 hours (paragraph 0041)	Removal rate of 99.1% achieved in 6 hours (specification, page 22, lines 24-27)

The volume of the treatment agent in Example 1 of JP '565 was calculated from the dimensions of the decomposing unit as described in paragraph 0040 (inner diameter of the unit = 42 mm; length of the unit filled with the agent = 300 mm). Space velocity (SV) indicates catalytic activity of the treatment agent with respect to the fluorine-containing compound and is calculated by dividing an actual flow rate of the gas under treatment by a volume of the treatment agent contained in the decomposing unit. Generally, a greater value for SV indicates a shorter contact time between the treatment agent and the gas being treated.

In Example 1 of the present application and Example 1 of JP '565, approximately the same removal rate was achieved for the same concentration of the fluorine-containing compound, and in this case, the treatment agent that achieves the result at a higher SV is considered to have a higher catalytic activity. As is clear from Table (I), the SV value for aluminum hydroxide is significantly greater than that for alumina, which indicate the superior catalytic activity of aluminum hydroxide. Also, in view of the lower reaction temperature in Example 1 of the present application, the superiority of aluminum hydroxide is notable.

As demonstrated in the above calculations, the treatment agent of Claim 1 including aluminum hydroxide particles is clearly distinguishable from alumina of JP '565, on the contrary to the assertion in the Office Action that "aluminum hydroxide and alumina are analogous catalysts for decompose the halogen containing compound." Although WO '824 refers to alumina and aluminum hydroxide as examples of the treating agent, the reference does not suggest the advantage of replacing alumina with aluminum hydroxide, nor does present any examples to demonstrate that the use of aluminum hydroxide provides advantageous effects on decomposition of perfluorocarbons or fluorinated hydrocarbons as compared to the use of aluminum oxide. Therefore, the subject matter of Claim 1 cannot be achieved based on JP '565 and WO '824.

In addition, the process of Claim 1 is further distinguishable over JP '565 in the absence of adverse affects from the production of aluminum fluoride. According to the method of JP '565, by using alumina in combination with calcium oxide or calcium hydroxide, aluminum fluoride is produced, which is highly disadvantageous because aluminum fluoride is considerably inactive and stable, and prohibits regeneration of alumina, leading to deactivation of the catalyst. Instead, according to the method of Claim 1, the combination of aluminum hydroxide and calcium hydroxide as the treatment agent can effectively inhibit formation of aluminum fluoride and suppress such deactivation of the treatment agent. Thus, a highly efficient and economic decomposition of the fluorine-containing compound can be achieved. Neither JP '565 nor WO '824 discloses such advantages attributable to the use of the treatment agent including aluminum hydroxide and calcium hydroxide.

As discussed above, the method of Claim 1 is distinguishable from JP '565 and WO '824 in multiple aspects including the chemical processes involved in the treatment as well as the composition and form of the treatment agent. Thus, even assuming that the two

references can be properly combined, such combined teachings are not believed to render the method of Claim 1 obvious.

Likewise, independent Claims 2, 5, 11, 14 and 19 include subject matter substantially similar to what is recited in Claim 1 in terms of the composition and form of the treatment agent. Thus, Claims 2, 5, 11, 14 and 19 are also believed to be distinguishable from JP '565 and WO '824.

Lastly, Applicants wish to bring to the Examiner's attention a partial English translation of JP '565 submitted herewith. Applicants believe that the translation would be helpful in the examination along with the English Abstract previously submitted to the PTO.

In view of the amendments and discussions presented above, Applicants respectfully submit that the present application is in condition for allowance, and an early action favorable to that effect is earnestly solicited.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, L.L.P.

Akihiro Yamazaki
Attorney of Record
Registration No. 46,155

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 07/09)